

ATARI INSTITUTE FOR EDUCATIONAL ACTION RESEARCH

OCCASIONAL PAPER # 1



 A Warner Communications Company

INFORMAL LEARNING AND COMPUTERS

A Working Paper prepared for the Atari  
Institute for Education Action Research

Sherman B. Rosenfeld, Ph.D.\*

September, 1982

\* Current Address: Youth Activities Department  
Weizmann Institute of Science  
Rehovot, ISRAEL

© 1982 Sherman B. Rosenfeld All right reserved.

## TABLE OF CONTENTS

	<u>Page</u>
Executive Summary	
Introduction	1
A. Informal Learning	2
1. What Is Informal Learning?	2
2. Why Is Informal Learning Important to Study?	4
3. Where Does Informal Learning Occur?	4
4. How Can Informal Learning Be Studied?	6
5. What Are the Research Findings?	7
B. Computers	11
1. Computer As Metaphor	11
2. Research on Computers in Informal Settings	12
3. Key Issues in Informal Learning and Computers	13
4. Toward An Anthropology of Information	15
C. Annotated Resource Guide	16
1. Museums	16
2. Libraries	18
3. Zoos	19
4. Media	19
5. Adult/Experiential Education	22
6. Informal Learning Projects	24
7. Computer Learning Projects	24
8. Software	26
9. Research	27
Recommendations to the Atari Institute	29
Bibliography	31

## EXECUTIVE SUMMARY

1. The field of informal learning deserves our attention, since this is the way we learn most of what we know. Until recently, this field has escaped the attention of most educators, who have tended to equate "learning" with "schooling."
2. Informal learning is learner-directed and it occurs in a vast variety of settings.
3. Perhaps the best way this field can be studied is through the use of naturalistic research, which aims at describing the participant's actual behavior and how participants "make sense" of their experience.
4. Naturalistic research has demonstrated that in informal education institutions (e.g., museums and zoos), visitors prefer exploratory behavior, search for interaction, place a high value on the social context, and engage in various learning/teaching behaviors. Children tend to manipulate and experience more than adults, who tend to read and vicariously observe their children.
5. Other studies of informal learning have included time-use studies, studies of lifelong learning, and studies of non-formal education (NFE) in developing countries. Clearly, more studies in this field are needed.
6. Key issues in informal learning include locus of control, social interaction, the search for interaction, play and exploration, incidental learning, and creativity.
7. Like informal education institutions, computers have evolved from being elitist (e.g., mainframe computers) to being responsive to individuals (e.g., personal computers). Also, computers can be conceived of as informal learning settings, since they incorporate many of the key elements found in these settings (e.g., they are highly interactive and give the user control). Furthermore, computers can act as a concrete metaphor of the learning process, giving people insights into their own styles of learning and encouraging them to become autonomous learners in diverse settings. For all these reasons, the marriage of informal learning and computers could be a mutually productive union.
8. We are beginning to learn about how computers are used in informal settings through research and the development of appropriate software, computer networks, and special projects (such as those sponsored by the Atari Institute).
9. But we need to learn more, by engaging in the type of "action-research" advocated by psychologist Kurt Lewin over 50 years ago. Such "research that makes a difference in real-world settings" should be applied to informal learning/computer projects. Key issues we need to further explore involve the nature of the unique medium of the computer, the development of software (programs and data bases),

barriers to and facilitators of access to the computer and its services, and issues relating to the centralization or decentralization of power. All these issues actually relate to the "hardware" of computing.

10. At the same time, we need to develop an "anthropology of information," which will help us understand what kinds of information people want, what form they want it in, how they use this information, and how the "computer culture" affects this. In this way, we can help computers become powerful tools to expand our understanding of the universe and of our roles in it.
11. An Annotated Resource Guide lists over 80 professional organizations, projects, and individuals involved in the field of informal learning and computers.
12. This working paper concludes with three sets of recommendations: 1) the Institute should become a clearinghouse of information and models of excellence in the area of informal learning and computers, 2) the Institute should take an active role in creating new models in the area of informal learning and computers, and 3) the Institute should sponsor a national conference on "Informal Learning and Computers" to help implement these recommendations and to stimulate further growth and development in this field.

## INTRODUCTION

"Our passions do not live in locked chambers, but, dressed in their small wardrobe of notions, bring their provisions to a common table and mess together, feeding out of the common store according to their appetite."

George Eliot  
Middlemarch

"The most incomprehensible fact about the universe is that it is comprehensible."

Albert Einstein

This position paper, prepared for the Atari Institute for Education Action Research, has three broad aims: (A) to draw attention to the field of informal learning (B) to stimulate thought, discussion, debate, and action in the area of informal learning and computers, and (C) to provide a road-map for interested individuals to pursue this field.

The paper is correspondingly divided into three parts. The first section (A) treats the topic of informal learning. What is it? Why is it? Why is it important to study? Where does it occur? How can it be studied? What are the research findings?

The second section (B) treats the topic of informal learning and computers. This section illustrates how the computer itself is its own informal learning setting, how its use may promote our own understanding of the way we learn, and what we are learning about computers in out-of-school settings. A variety of research questions are posed as is the need for studying the anthropology of information. (C) is an Annotated Resource Guide. It lists organizations, projects and individual projects which may be of use to interested individuals.

Acknowledgements: Thank you to Dr. Ted Kahn, for loaning me a variety of books and ideas; to Dan Fingermann, for references on "lifelong learning"; and to Dr. Emily Adams, Dr. Analee Elman, Dr. Patricia Greenfield, Liza Loop, Priscilla Watson, Dan Watt, and Ramon Zamora for their conversations and suggestions.

To all of these people (especially Ted), my gratitude to you for helping me discover that computers can be much more than information machines.

## A. INFORMAL LEARNING

"I remember those times...All the hours that mattered most to us, in terms of passion, high stakes, day dreams and ideal... all of those hours were 'sneaked in,' 'unlicensed.'...We got no credit hours for them."

Jonathan Kozol  
The Night Is Dark and I Am Far From Home

"Golfers and scientists have quite a lot in common. They both face problems of their own choosing. And they take frank delight in the never-ending process of trying to solve the problems they have chose.

"In my opinion, that's living."

John Gardner  
No Easy Victories

About 3 million years ago, ape-like beings left the forests and inhabited the grasslands and open plains of Africa. About 100,000 years ago, our own species, Homo sapiens, came into being. About 10,000 years ago, the Agricultural Revolution began, bringing with it the rise of cities and civilization.

During the overwhelming majority of this period, there were no schools. When schools finally evolved, they were usually limited to an aristocratic setting. Public mass education via schooling began in the 19th. century.

The dominance of our species over a million others is largely due to our cultural adaptability and unique social behavior. Unlike other life forms, our cultural evolution has overtaken our biological evolution in helping us adapt to new surroundings. Cultural evolution was spearheaded by the development of language, the process of representing objects not by their likeness, but by symbols. Human language was not invented in the classroom.

All this is well-known. Yet, through some strange form of cultural bias, we often speak of "education" or "learning" as synonymous with formal schooling. By doing this, we severely constrict our notion of human learning.

### 1. What Is Informal Learning?

Informal learning is here defined as "voluntary, self-directed, free choice learning." Such "learner-directed learning" usually occurs in out-of-school settings. By definition, this is an enormous topic,

yet one which has curiously escaped widespread attention, especially among educators. The term exists because of our "education = schooling" notion. As our concept of learning becomes more enriched, perhaps there will be less of a need to distinguish whether it occurs in or out of "schools."

Schools are places where some people ("teachers") communicate knowledge and skills to others ("students"), usually for the purpose of certification (e.g.; getting credit for classes, obtaining a degree) which demonstrates that the student has actually acquired what the teacher has presented. Schools are typically organized by homogeneous and captive groupings, clear goals, and the presence of positive feedback (e.g., grades, test scores).

By contrast, informal learning is self-motivated and self-directed; it includes a wide variety of forms. For example, museum visits can be characterized by a heterogeneity of learner groups in terms of background and interests, free choice of learners, lack of prerequisites and credentials, usually accompanied by the importance of social interaction (Laetsch, 1979). Day-to-day informal learning can be described as "the semi-random web of experiences, facts, 'lessons,' impressions and accumulated knowledge that we continually draw upon" (Tressel, 1979). Informal learning can also be understood by contrasting learning via a family zoo visit and via a classroom (Rosenfeld, 1980):

	<u>Family Zoo Visit</u>	<u>Formal Classroom Lesson</u>
EXPECTATIONS	"To have a good time."	"To learn something."
CRITERIA OF SUCCESS	<u>The process:</u> concrete interactions which promote social interactions.	<u>The product:</u> achievement of specified learning goals and objectives.
MAJOR VEHICLE OF INFORMATION FLOW	Concrete experiences: Episodic, multisensory experiences with social interactions.	Written text: Articulated, linear sequences.
TYPE OF LEARNING STRESSED	Unsystematic, concrete knowledge and experiences  Personal: 1st and 2nd person perspective  Affective component  Social interaction  "Experience-rich, information-poor"	Systematic, abstract knowledge  Objective: 3rd. person perspective  Cognitive component  Individual achievement  "Information-rich, experience poor"
LOCUS OF CONTROL	The learner(s)	The teacher(s)

For adults, informal learning is often motivated by a perceived, immediate need of the learner (e.g., fixing the water faucet). Learning can result as a response to that need (i.e., learning to fix the faucet) and may or may not lead to a systematic study of the entire domain (e.g., a comprehensive knowledge of all household repairs).

The above, somewhat stereotypical comments, are meant to sketch the broad features of informal learning. Generally speaking, informal learning involves following one's curiosity and interests in out-of-school settings.

## 2. Why Is Informal Learning Important to Study?

There are a variety of answers to this question, among the following:

- a) Quantity of Time Spent. Clearly, people spend more time out of school than in school. People who value the learning/teaching process could enhance their effectiveness (as learners and teachers) by better understanding informal learning.
- b) Increased Leisure Time. With the increased leisure time that has accompanied modern life, the opportunity for expanding one's sense of fulfillment increases, as does the opportunity for greater boredom. We might be better able to promote the former activity by understanding how informal learning naturally occurs.
- c) Intrinsic Motivation. Much of the success of any form of learning results from motivation. How might we promote intrinsic motivation? In many cases, conventional schooling ignores this question and becomes a form of "iatrogenic" illness, i.e., an illness caused by the medicine itself! The love of learning, the ability to choose and solve problems, curiosity, and self-discipline are some of the best fruits of a good education, however acquired. Intrinsic motivation, an essential element of informal learning, is an ideal topic for study in out-of-school settings, as well as the tree which bears these fruits.
- d) Computers. With the appearance of low-cost personal computers, the topic of informal learning takes on special meaning. While these computers are becoming more ubiquitous, they are also blurring the distinction between formal and informal learning. An understanding of informal learning may help them become better integrated in both school and out-of-school settings and promote better learning in all environments.

## 3. Where Does Informal Learning Occur?

The settings where informal learning occurs are numerous. A complete taxonomy of these settings would include the social rules and expectations associated with each setting. For this reason, such a taxonomy needs to be generated by studying the participant's own point of view; indeed, there could be a variety of different taxonomies, each corresponding to a different group of participants (e.g., distinguished by age, culture, background, expectations).

According to Spradley and McCurdy (1972), culture is "the knowledge people use to generate and interpret social behavior. This knowledge is learned, and, to a large degree, shared." There are hundreds of "cultural scenes" in everyday life, and learning occurs in each of them (e.g., how to perform one's job, how to raise one's children). There are also hundreds of different "social situations," which are made up of people, their interactions, a location/place, and objects. Spradley and McCurdy caution that:

"...it is important not to confuse a cultural scene with a social situation. The former is the knowledge which actors employ in a social situation; the latter is the observable place, events, objects and persons seen by an investigator. There are many ways in which a particular social situation can be defined by those who perceive it."

Indeed, this is what makes a complete taxonomy of settings where informal learning occurs so difficult to generate. To a mother, a kitchen may be understood as a place to try out new recipes but not as a playspace. To her child, this may be so. Each uses the same location for different learning purposes.

Understanding that there are limitations in listing out-of-school settings without considering the variant "cultural scenes," here is one approach at categorizing these settings:

- a) Work Settings: Telephone company, doctor's office, airline ticket counters, police department, etc.
- b) Recreational Settings: Parks, playgrounds, amusement parks, ski resorts, zoos, summer camps, retreats, movies.
- c) Information Centers: Museums, libraries, community centers, etc.
- d) Home Settings: Backyard, kitchen, bedroom, study, living room, etc.
- e) Social Settings: Restaurant, park, home of friends, etc.
- f) Consumer Settings: Stores, shopping malls, restaurants, etc.
- g) Therapeutic Settings: hospitals, psychiatrist's office, etc.

Out-of-school learning must take into account two other aspects, in considering where and how such learning takes place:

- a) Information Medium. Magazines, newspapers, radio, television, computers, video, and the like each provide obvious learning opportunities. These opportunities vary depending upon where the information medium occurs (e.g., home, business, etc.), under what conditions (e.g., time of day, social group present, etc.), and how effective the medium is at communicating information, ideas, and images.

b) Organized Groups. Groups can be informal or formal, public or private, rural or urban. They can vary according to topic area, degree of structure, goals, membership (e.g., age, sex, socio-economic status), and expectations. Church groups, hobby clubs, Boy Scouts, athletic groups, social clubs, service groups, etc. each provide ample learning opportunities.

Another way of categorizing informal learning settings is through a series of variables. For example, Adams (1980) developed a "learning contexts profile" composed of 14 variables grouped into four main dimensions (internal structure, intentionality, loci of control, and constituency). A setting is categorized by assigning a value to each variable, which has gradations from formal to informal education. Likewise, Caspi and Kibel (1981) have developed a system for generating/classifying up to 200,000 alternative ways to teach/learn a subject. The system is composed of 8 main domains (subject matter, educating force, target audience, audience focus, space, time, design criterion, method) with numerous variables for each; these variables also have gradations from formal to informal learning.

This brief discussion of where informal learning occurs should illustrate the incredible diversity of opportunities which exist for this type of learning, for people of all ages.

#### 4. How Can Informal Learning Be Studied?

Perhaps the most characteristic feature of informal learning is the participant's free choice and initiative. This feature suggests that research in this field focus on the participant's view and what "learning opportunities are available in the chosen setting.

Naturalistic research of human behavior documents and analyzes "what is actually happening" in naturally occurring settings. The emphasis is on two aspects:

- a) The participant's actual behavior, and
- b) The meanings participants ascribe to the setting and to their behavior in it.

The corresponding tools of naturalistic research are (a) detailed and trained observations, and (b) in-depth and focused interviews. The specific research tools derive from two traditions: (a) ethology, the scientific study of animal behavior, and (b) anthropology, the scientific study of human cultures. Each tradition places a great deal of emphasis on the process of description. This emphasis, as applied to the study of informal learning, cannot be overstated. "Without sufficient descriptive information, the wrong problems are selected for study, inappropriate hypotheses are tested, and erroneous inferences are made" (Brandt, 1972).

Descriptive studies of informal learning in Western societies are relatively recent. According to Scribner and Cole (1973), there has been a "curious discrepancy: most of our knowledge about informal education is based on field work in traditional, nonliterate societies, whereas most of our knowledge of formal education is based on studies of educational institutions in industrialized, literate societies." Here is an interesting example of research bias! Even when anthropologists study the anthropology of education they almost exclusively study the anthropology of schooling (e.g., Roberts and Akinsanya, 1976). Anthropologists and cognitive psychologists are just beginning to pay more attention to informal education (e.g., Greenfield and Lave, 1982).

### 5. What Are the Research Findings?

The few research studies on informal learning paint an interesting picture. Most of the studies have focused on learning in such institutions as museums, zoos, and aquaria. Some time studies have been done of children in the home setting. These studies, combined with other experimental work, help isolate several key issues in out-of-school learning.

a) Studies in Informal Education Institutions. Several patterns emerge from research in science museums (Diamond, 1980), student field trips (Falk, et al, 1978; Gottfried, 1979), zoos (Rosenfeld, 1980), and aquaria (Serrell, 1978). I will concentrate my discussion on the studies quoted, though there are others reported as well (consult these studies for additional references). Some common findings:

- \* Preference for Exploratory Behavior. Gottfried's study of children visiting a free-choice biology lab in a science center identified a predictable pattern of exploration. The cycle began with "diversive exploration," and could be followed by 6 other behaviors. Family groups in the science centers and zoos spent a small amount of time with the overwhelming majority of exhibits; Diamond found that 18% of the exhibits were attended to for more than 3 minutes, while Rosenfeld found that less than 20% of the zoo exhibits were visited for more than 90 seconds. There seemed to be a common need in all the settings studied for participants to explore widely but not in much depth. Falk found that the novel setting of the field trip interferred with task learning; students visiting the same site a second time were more able to "settle down" to learn specific details.
- \* Search for Interaction. Perhaps the most predictable pattern in all the studies can be described as the search for interactive experiences. Thus, children in the biology lab were attracted to activities where they could become personally involved; they relatively ignored large areas of the setting, where this could not happen. Visitors to the science museums and zoos followed an identical pattern. In fact, visitors were more attracted to the pigeons and squirrels in the zoo, than to most of the other animal exhibits!

- \* Prominence of Social Context. Visitors perceived their visits largely as social occasions. For example, more motivations for going to the zoo related to the zoo's context (e.g., a place to bring the kids, a nice family outing, etc.) than to its content (e.g., to see the animals). In both the science museums and the zoo, the emphasis was on how to have a successful family outing; this usually meant making certain the children were happy.
- \* Children vs. Adults. Children manipulated the science exhibits more than the adults did; the latter read more than the former. This relationship occurred in the zoo and aquaria studies as well. While adults claimed to have taken the outing "for the kids", in many cases they used the opportunity to enjoy/learn as well. In fact, several adults seemed to use their children as "passes" in entering a setting where they would not typically visit alone; yet, they were as interested in these settings as their children. These findings are consistent with the observation that adults often vicariously watch while their children play (with the computers as well as with swings and slides).
- \* Learning and Teaching. In the science museums, families exhibited two different teaching/learning strategies: "show," a series of non-verbal gestures, and "tell", a series of verbal instructions. Parents displayed both of these behaviors more than their children. "Show" was more common with mother-daughters than with father-sons, and "tell" was more common the other way around. In the zoo and aquaria, questions asked about the animals were concrete, not abstract. Children in the biology lab followed a predictable progression in their activity as teachers. During the visit, the showed each other various manipulative activities; only when they acted as "teachers" back at their schools did they engage in more analytical and measuring types of behaviors. Other research has also confirmed the finding that for visitors in free-choice settings, "discovery precedes measurement." The central focus of such visitors seems to be "the search for authentic experience."

b) Studies of Time-Use in the Home Setting. A recent study of children's use of time outside school (Medrich, et al., 1982) has produced a rich data base, suggesting many implications. Among the findings:

- \* Five Domains. Five areas of time-use were identified: 1) children on their own, 2) children and parents together, 3) jobs, chores, and spending patterns, 4) organized activities, and 5) television. The average daily time commitments of the children (aged 11 - 12 years old) were: television, 3-4 hours; time on own (not counting television), 2-3 hours; parent-child time, less than 1½ hours; chores, jobs, etc., less than 1 hour; and organized activities, 4-5 hours per week.
- \* Dominance of Television. It was estimated that by the time children finish high school, they have spent 11,000 hours in the classroom and about 65,000 hours outside, of which over 15,000 hours have been spent watching television.

- \* Peer Groups. The children often felt bored when out of school, but contact with their peers (more than with their parents) ameliorated that boredom.
- \* Availability of Parents. Parents in the poorest and the wealthiest families were the most available for their children. The most common activity of parents and children together was watching television. Most parents and children said they went places together, but the choice of trips reflected cultural, educational and material differences.
- \* Jobs and Work Ethic. Children did not see many positive role models engaged in work. They had few meaningful responsibilities and saw work as a means to make money, not as a means of creative fulfillment.

c) Studies in Lifelong Learning. In the last 10 years, the field of "Lifelong learning" has blossomed (Cross, 1981; Knowles, 1978; Peterson, 1979). According to an in-depth study by Tough (1971), the average adult engages in over 8 "learning projects" per year. A "learning project" is defined as at least 7 hours of time devoted to specific learning episodes organized around a particular goal. Motivations for engaging in such a project included use for taking action (29%), puzzlement, curiosity, having a question (22%), use to impart to others (12%), and use in an examination (2%). The overwhelming majority of such projects took place outside classrooms.

Two forces play important roles in lifelong learning: the media and social groups. Television, magazines, newspapers, radio, and film, are constant sources of information. Also, people spend enormous amounts of time engaged in informal learning in social groups, such as conventions, clubs, trips, and hobby groups. As Phil Morrison (1981) points out, these people "already have the autonomous quality of the best in higher education." Unfortunately, studies about the effects of media and social groups on lifelong learning are lacking.

d) Studies of Non-formal Education (NFE). In the mid-1960's, groups involved in educational policy-planning in developing countries, such as UNESCO, began to label many out-of-school educational services as non-formal education (NFE). Some theoretical work and research reports of NFE projects are available (see Adams, 1980 and references 4.4-4.6 in the Resource Guide).

e) Key Issues in Informal Learning. There appear to be 6 interconnected issues which dominate the research literature associated with informal learning. They are:

- \* Locus of Control. The perception of "being in charge" and being the origin of one's behavior results in an increased level of intrinsic motivation. The opposite feeling (e.g., being a pawn and helpless) leads eventually to a lack of initiative and depression. Clearly, free-choice learning environments can promote the former perceptions and minimize the latter ones.

- \* Social Interaction. In terms of our evolutionary heritage, it makes no sense to ignore the importance of social interaction in the learning process. Yet this often happens when individual achievement is the prime goal of schooling. Free-choice learning settings allow groups of individuals (families, cross-age groupings, peer groups) to interact with each other. Indeed, social bonding appears to be a strong motivation for visiting these settings in the first place.
- \* Search for Interaction. Interactive experiences are clearly preferred to non-interactive ones by most people, children and adults alike. Given the choice, people (especially children) will do first and read later. Of course, not all interactive experiences involve learning but many do.
- \* Play and Exploration. By nature, people seem to be stimulus-seekers some more than others. Play interaction is a primary learning tool, especially (but not exclusively) for children. Exploration, i.e., getting an overview of a particular terrain (physical and/or cognitive), is a natural activity in free-choice settings. At the beginning of an encounter with a novel setting, people will spend a great deal of time exploring and "getting the lay of the land." There are obvious cultural barriers to play and exploration, particularly among adults. Since exploration is the first step in free-choice learning, it is essential to identify these barriers and find ways to remove them.
- \* Incidental Learning. Since much activity in free-choice settings involves exploration and "browsing" behavior, one cannot always predict the outcome of an informal learning episode. Perhaps one will "learn" nothing at all. Most likely, one will learn something; often it will be "unexpected." The lack of anxiety-producing judgements (e.g., social pressure to perform) often makes it easy to learn when one does not "have" to do so. Much consumer behavior (e.g., shopping and buying) is involved here.
- \* Creativity. In a free-choice setting, one may be receptive to new experiences, while feeling "in charge" and playful. These conditions foster the ability to look at old things/ideas in new ways, and to generate new ideas and perspectives.

As we become more familiar with these key issues, through research and our own creative efforts, we will better learn how to design learning opportunities which are intrinsically motivating, and which stimulate question-asking, problem-choosing, problem-solving, and information-seeking.

There is no doubt that computers can help integrate such learning opportunities within themselves and within other settings. They have already done so, though their potential in this regard is just now beginning to be explored.

## B. COMPUTERS

"In most areas, the technological capability to produce computer power is far ahead of the human understanding of how to use that power effectively and cooperatively."

Joseph Dekem  
The Electronic Cottage

There is a curious parallel between informal education institutions with computers. Early in their history, museums and zoos were managed with little regard for the common folk. Museums housed the great collections of the aristocracy; likewise, the first menageries were kept for the status and amusement of the royal class. As these and similar institutions evolved, they slowly became accessible to the scholarly class, whose primary interest in these collections was in their conservation. When they opened their doors to the masses, these institutions still were committed to the culture of conservation. Only recently have museums and zoos seriously started to explore informal learning, from the visitor's point of view.

Likewise, computers began as --by necessity--sort of an elitist operation. As they evolved in speed and reliability, their primary functions have included a good deal of maintenance tasks, e.g., record-keeping, personal computer, informal learning is becoming an important concern.

There is another parallel. Simply stated, computers can be conceived of as informal learning settings, environments of their own. And the central issues discussed above as relating to informal learning--locus of control, social interaction, search for interaction, play and exploration, incidental learning, and creativity--are currently being enhanced by personal computers.

1. Computer As Metaphor. Computers are good at doing a lot of things. They might be conceived of as data-cruncher, slave, toy, secretary, and personal tutor. But perhaps the most intriguing use of computers will be to act as a concrete metaphor for the process of learning itself. This idea, developed by Minsky (1970) and Papert (1980), is that through the process of getting to know the computer and how it works, children (and adults) will develop a concrete notion of what it means to "learn to learn". Minsky lists over 35 well-defined and implemented ideas dealing with computers which can be used "for thinking about thinking." Few of these concepts exist in traditional psychology. For example, as Minsky notes:

"The idea of debugging itself...is a very powerful concept--in contrast to the helplessness promoted by our cultural heritage about gifts, talents, and aptitudes. The latter encourages "I'm not good at this" instead of "How can I make myself better at it?"

Why might it be so important for the computer to act as this sort of concrete metaphor for the learning process? Why might it be so important for children (and adults) to become "epistemologists," as Papert suggests? The answer, I believe, is clear: knowing how one learns will help one learn better. And the computer-literate person will have access to an enriched model of learning, through the process of interacting with the computer. This model could give people insights into their own unique learning styles and give them confidence to take active roles as learners in a variety of different settings.

Computers can also act as teachers and guides, amplifying the best aspects of teaching, learning, and creating. For example, Brown and Lewis (1968) list seven fundamental functions of the creative process which can be stimulated with the use of computers. Also, Caspi (1977) has conceived of eight "rooms" which personify different creative processes: these rooms (e.g., the Fantasy Room, the Excavation of Dead Days Room) can be easily simulated via the computer.

2. Research on Computers in Informal Settings. The last few years have seen an interest in studying the learning potential of personal computers in out-of-school settings (e.g., Levin and Kareev, 1980; Malone, 1980; Papert, 1980; White, 1981).

Much of this interest has focused on the motivational aspects of computer games. Malone studied what makes computer games "fun", and devised a theory of intrinsically motivating instruction based on his descriptive/observational research. This theory takes into account challenge, fantasy, and curiosity. Kee (1981) has suggested a set of other experiments to inquire into the motivational aspects of computer games.

Levin (1982) reports another descriptive/observational study, a "diary study" by Yaakov Kareev which involved his two boys, aged 7½ and 6 years old. There was a progression of usage of the home computer, beginning with intense interest in a wide variety of computer games. After this exploratory period (many games were played each for brief periods), the boys spent more time on fewer games. Later, the boys grew interested in graphics and music programs. A "high point" was their assistance in producing a picture and song for Hannukkah. Next, they were introduced to a text editor program, which they used primarily for writing "crazy stories," text entered by hitting keys randomly. Someone showed them how they could modify programs, which they did. Toward the end of the 7-month study, the boys used the computer to calculate how much money they had earned from babysitting. During the study, the boys spent an average of 1 hour a day at the computer; this time seemed to displace the boys' television-viewing time.

Another area of research deals with the development of appropriate software, computer networks, and organizations to implement creative uses of computers in out-of-school settings. The Atari Institute for Educational Action Research has supported a wide variety of these projects, including the following:

- \* Capital Children's Museum. CCM offers computer programs and courses to children and teachers at their Future Center. The Museum also has a 9,000 square foot exhibition, Communication, which presents a historical tour through the variety of ways information has been and is being transferred, from early cave drawings to computers.
- \* ComputerTown, USA. This computer literacy project of the People's Computer Company, has an ambitious goal: to help local residents in cities around the world establish "public access computer centers" in their own towns. These centers--located in libraries, old age homes, and other settings--seek to provide informal learning opportunities to the local residents. A "do-it-yourself" implementation kit to establish ComputerTowns is available (Loop et al., 1982).
- \* Santa Clara County Industry Education Council Mobile Computer Van. This Van carries Atari computers to a variety of different settings, giving diverse populations access to hands-on computer experience. Through exploration, play and guided activities, people of all ages learn about computers on their own terms.

The conception and implementation of these and other innovative projects need to be accompanied by action-research. This term, first coined by psychologist Kurt Lewin in the early 1920's, may be defined as "research devoted to social change," or "research that makes a difference in real-world settings." Such action-research, designed to answer questions similar to the ones posed below, can have a tremendous impact in promoting the thoughtful and creative use of computers for informal learning.

### 3. Key Issues in Informal Learning and Computers.

What questions should we be asking? To answer this question, let us assume that "computing" can be defined as the relationship between three entities:

- (a) the hardware (i.e., the computers),
- (b) the software (i.e., the programs and data bases), and
- (c) the warmware (i.e., the people who "produce" (a) and (b), and the people who "consume" it)

Our questions might be divided into four groups, dealing with the unique medium, development of software, access, and control.

#### (a) The unique medium.

What characterizes the unique medium of the computer?

How is it similar to and different from other media (e.g., film, T.V., video, books, paint, poetry)?

How can we be sure we aren't using the computer medium as if it were another medium (e.g., some museums paste enlarged books on their walls)?

What does it really mean for something to be interactive?

How can we creatively think of the computer (e.g., as intellectual

amplifier, musical instrument, friend, simulator, automobile, poet, etc.)?

How do people actually think of and use the computer in different settings?

(b) Development of Software (programs and data bases).

How do the "producers" and "consumers" of software differ (in terms of values, expectations, criteria of success, rewards, outlook etc.)? What are the implications?

How might software be developed to enhance the unique medium of the computer?

How might software best incorporate elements vital to informal learning (e.g., locus of control, social interaction, play and exploration, incidental learning, creativity)?

Who are the best candidates for designing the best software? (children? "experts" who have little knowledge of computers?)

How to engage them in the development of software?

How might well-organized data bases be designed so that they do not become harder to use the more sophisticated they become?

How do people actually think of and use software in different settings?

(c) Access.

What are barriers to and facilitators of "access", i.e., the ability for people to use computers and its software, to gain entry into appropriate fields of knowledge, and to use services accessible only through the use of a computer?

Why do some people fear using computers?

Why do some people love using computers?

How do people actually gain access to computers and how do they help others do so in different settings?

(d) Control.

What factors or elements of a given situation will likely lead to the use of computers as an agent of the centralization of power?

What factors or elements of a given situation will likely lead to the use of computers as an agent of the decentralization of power?

What are the effects of this centralization and/or decentralization, in particular as they relate to learning?

How do people actually use computers to gain, horde, share, and/or distribute power in different settings?

The invention of a tool--be it a knife, a laser, or a computer--is an amoral act. Tools can be used for creative or destructive purposes. In the "computing" definition above, the values, decisions, and actions of the "wareware" can make all the difference. This realization underscores the importance of action-research.

#### 4. Toward An Anthropology of Information.

Knowledge, especially when it is restricted but important knowledge, is power. If the Information Age and the Learning Society make any sense at all, then we must study some basic issues: What kinds of information do people perceive as important? What forms do they want it in? How do people use information? What are barriers that prevent people from (a) finding the information necessary, and (b) using it effectively? How does the "computer culture" affect people's perceptions of information and their access to it?

Answers to these and related questions can best be answered by studying the human interaction with computers. France has a rich research tradition in "ethnotechnology," the anthropology of technology, according to Seymour Papert. Such a research tradition does not exist in the United States, but is a perspective that needs more attention.

For, ultimately, we are not talking about computers and informal learning. We are talking about how we can take advantage of a powerful tool that can greatly enhance and expand our understanding of the universe and of our roles in it. Let us hope that this technology encourages us to take advantage of it, to explore the "incomprehensible fact" that the universe is comprehensible.

"To me, recreational games are the least exciting. More exciting are activities that engage even more fully the intellectual resources and values and social motivations of man--science, teaching, governing. Those activities involve companionship, novelty, risk, chance-taking, skill, team play, competition, and all the other attributes of diversion. And they mean something."

John Gardner  
No Easy Victories

## C. ANNOTATED RESOURCE GUIDE

"Anyone who doesn't know the relationship between entertainment and education doesn't know much about either."

Marshall McLuhan

This section presents an annotated list of organizations, projects and individuals in the field of informal learning and computers. Within this field, interest in the use of computers is growing rapidly.

This Resource Guide is divided into the following categories:

- 1) Museums
- 2) Libraries
- 3) Zoos
- 4) Media
- 5) Adult/Experiential Education
- 6) Informal Learning Projects
- 7) Computer Learning Projects
- 8) Software
- 9) Research

### 1. MUSEUMS

1.1 American Association of Museums (AAM)  
1055 Thomas Jefferson St., NW  
Suite 428  
Washington, D.C. 20007  
(202) 338-5300

Umbrella professional organization of all museums in the U.S. Numerous publications, annual conferences, monthly newsletter (AVISO). Growing discussion on the use of information technology in museums. Has Standing Committee on Education.

1.2 American Association of Youth Museums (AAYM)  
1919 N. Water  
Corpus Christi, Texas 70401

Umbrella professional organization of all youth museums in the U.S.

1.3 Association of Science-Technology Centers (ASTC)  
1016-16th. St., N.W.  
Washington, D.C. 20036  
(202) 452-0655

Umbrella professional organization of all science museums in the world. Numerous publications, bi-annual conferences, monthly newsletter. Widespread use of computers in member organizations.

1.4 Museum Computer Network, Inc.  
Center for Contemporary Arts and  
Letters  
ECC, Building 26  
State University of New York at  
Stony Brook  
Stony Brook, NY 11794  
(516) 246-7790

1.5 Joan M. Sustik  
Wey Computing Center  
University of Iowa  
Iowa City, IA 52242

1.6 Western Interpreters Association  
(WIA) c/o Don Neubacher  
Pt. Reyes National Seashore  
Pt. Reyes, CA 94956  
(415) 663-1200

1.7 Museum Education Roundtable (MER)  
c/o Ken Yellis, Room 195  
National Portrait Gallery  
Washington, D.C. 20560

1.8 Noteworthy works:  
a) Collins, Zipporah. Museums, Adults and the Humanities: A Guide to Resources. American Association of Museums, 1981.

b) Rhee, David (editor). Creating Museum Exhibits About Computers: A Guide to Resources. Association of Science-Technology Centers (ASTC), 1981.

c) Rhee, David (editor). Survey of Computer Use in Science-Technology Museums, ASTC, 1981.

d) Pittman-Gelles. Museums, Magic & Children: Youth Education In Museums. ASTC, 1982.

Updates information relative to the use of computers in museums. Recent interest in video image banks and interactive videodiscs. Relevant news, publication references, articles published in Spectra, a newsletter of the Center for Contemporary Arts and Letters.

Art History Interactive Videodisc project at the University of Iowa. A 12 page article on the project is available from Joan Sustik.

An association of park, nature preserve, zoo and museum. Publishes journal, The Interpreter.

Publishes Roundtable Reports, holds meetings, outings, workshops and other events relevant to museum education. Excellent focal point for museum educators.

2. LIBRARIES

2.1 American Library Association (ALA)  
50 E. Huron St.  
Chicago, Illinois 60611  
(312) 944-6780

2.2 Library & Information Technology (LITA)  
Division  
50 E. Huron St.  
Chicago, Illinois 60611  
(312) 944-6780

2.3 American Association of School  
Librarians (AASL)  
50 E. Huron St.  
Chicago, Ill. 60611  
(312) 944-6780

2.4 Library & Computer Newsletters  
a) Access: Microcomputing in  
Libraries  
POB 764  
Oakridge, Oregon 97463  
Editor: Debby Christians  
(503) 782-2111 (wk)  
(503) 782-3649 (hm)

b) Small Computers in Libraries  
Allan Pratt  
University of Arizona  
Tucson, Arizona 95721  
(602) 626-3565

2.5 Maggie's Place  
Pike's Peak Regional Library  
District  
20 N. Cascade Ave.  
POB 1579  
Colorado Springs, Colorado 80901  
(303) 473-2080

National Association of Libraries,  
Publishes American Libraries, a  
journal.

Publishes (for members only, 3x/yr.)  
the LITA Newsletter. Networking of  
library-computer projects. Continuing  
education for librarians. Donald  
Hammer, Director.

Publishes journal, School Library  
Media Quarterly, which includes  
articles on computer projects, and  
a newsletter. Alice Site, Director.

These newsletters began in 1981 and  
are devoted to the use of personal  
computers in libraries. Current state-  
of-the-art projects are reported and  
reviewed.

An imaginative computer-related  
project in a public library. "Maggie"  
is a PDP1170 (Digital) computer,  
which is used for library management  
and public use (e.g., on-line catalog;  
community catalog: carpool, day care,  
clubs & courses information).  
Kenneth Dowlin, Director of the library  
district, conceived of Maggie.  
Emmitt Kraft is the Computer  
Operations Supervisor.

2.6 Micro Timesharing  
POB 4658  
Salinas, CA 93912  
(408) 424-0596

Business which places coin-op personal computers in libraries. Kim Cohan is the 18 year old founder of the company, which has at least 2 other competitors in the field.

2.7 Los Altos Community Library  
13 South San Antonio  
Los Altos, CA 94022  
(415) 948-7683

Provides coin-op personal computers to patrons (from Micro Timesharing). Carol Tefft, librarian, initiated the project.

### 3. Zoos

3.1 American Association of Zoological Parks and Aquariums (AAZPA)  
Ogle Bay Park  
Wheeling, West Virginia 26003-1698  
(304) 242-2160

Umbrella organization of all zoos and aquaria in the U.S. Publishes newsletter, has annual conferences and Education Committee

3.2 International Association of Zoo Educators (IAZE)  
c/o Dr. R. Kirchshofer  
Zoologischer Garten Frankfurt/Main  
6 Frankfurt am Main  
Alfred Brehm-Platz 16  
West Germany

Primary purpose is to promote learning in zoos. Has regular conferences and publishes newsletter.

IAZE Newsletter  
c/o Judith White  
National Zoo Education Office  
Smithsonian Institution  
Washington, DC 20008  
(202) 673-4724

Several zoos are working on plans for computer-related exhibits, including the National Zoo (Washington D.C. ) and the Washington Park Zoo (Portland, Oregon).

### 4. MEDIA

4.1 National Media Programs  
Telecourses - X003  
Courses by Newspaper - X002  
University of California, San Diego  
(UCSD)  
La Jolla, CA 92093  
(714) 452-3446  
Susan Graff, Coordinator

Hundreds of Colleges and universities participate in these telecourses, which have included "COSMOS" "Connections", "American Families in Transition", and "The Ascent of Man." Each January and September, over 400 newspapers carry a series of articles on a particular subject UCSD coordinates both of these programs. (See 4.5)

4.2 Association of Educational Communications and Technology (AECT)  
1126-16th. St., N.W.  
Washington, D.C. 20036  
(202) 466-4780

Professional organization of media specialists. Focuses on improving learning through technology. Numerous publications, including newsletter.

4.3 Audio Cassettes

- a) Psychology Today Cassettes  
Dept. A0120  
POB 278  
Pratt Station  
Brooklyn, NY 11205
- b) Audio Forum  
145 E. 49th. St.  
N.Y., N.Y. 10017  
(212) 753-1783
- c) Caedmon  
1995 Broadway  
N.Y., N.Y. 10023  
(800) 223-0420
- d) Audio Book Company  
Box 9100  
Van Nuys, CA 91409  
(213) 799-4139

These firms specialize in spoken-word cassettes, which may be bought or rented by mail. (a) sells talks by well-known psychologists; (b) has a large number of lectures and speeches, also some poetry and radio shows (e.g., Abbott and Costello); (c) sells plays (e.g., Macbeth), children's books (e.g., The House at Pooh Corner), and poetry; (d) sells and rents full-length fiction and non-fiction. All these firms supply catalogs upon request. There are many other audio-cassette firms in the business.

4.4 Clearinghouse on Educational Communication  
Academy for Educational Development (AED)  
1414-20th. St., N.W.  
Washington, D.C. 20036  
(202) 862-1900

AED is a major consulting group. One of its projects, the Clearinghouse, publishes a quarterly periodical, The Development Communication Report, which focuses on the use of communication technology in the Third World.

4.5 "Distance Learning"

- a) Open University  
Great Britain
- b) Chicago Television College  
Chicago, Illinois
- c) Empire School of the Air  
New York, N.Y.
- d) University of Mid-America  
Nebraska

This term applies when learners receive instruction at a distance, usually with the aid of radio, TV or videotape. Not all "distance learning" is taken for credit and/or credentials (see 4.1). The four institutions listed are leaders in this field.

4.6 Dr. Howard Hitchens  
4600 Connecticut Ave., N.W.  
Washington, D.C. 20008  
(202) 244-1775

A former Director of AECT (see 4.2), Dr. Hitchens is preparing a report for UNESCO on the use of educational technology throughout the world.

4.7 Science Media Specialists

- a) Ray Earnes, Designer  
Office of Charles and Ray Earnes  
901 Washington Blvd.  
Venice, CA 90405
- b) Stephen Jay Gould  
Prof. of Geology & Biology  
Harvard University  
Museum of Comparative Zoology  
Cambridge, Mass. 02138
- c) Don Herbert  
Mr. Wizard Studio  
Prism Productions  
POB 83  
Canoga Park, CA 91305
- d) Adrian Malone  
Executive Producer, Ascent of  
Men and COSMOS  
KCET  
4401 Sunset Blvd.  
Los Angeles, CA 90027
- e) John Mansfield  
Executive Producer, NOVA  
WGBH  
925 Western Avenue  
Boston, Mass. 02134
- f) Philip Morrison  
Institute Professor  
Massachusetts Institute of Technology  
Dept. of Physics  
Cambridge, Mass. 02139
- g) John Ward  
Executive Producer, Universe  
CBS  
51 West 52nd. St.  
N.Y., N.Y.10167

In February of 1981, a 2-day Science Media Conference was held at the Exploratorium, a hands-on science center in San Francisco. Many of the 50 participants were science specialists in television, film, radio, newspapers, books and magazines. The few listed here all have a keen working knowledge of the close relationship between entertainment and learning.

Charles and Ray Earnes have produced fascinating short-length films; Don Herbert is T.V.'s legendary "Mr. Wizard"; Malone, Mansfield, and Ward have produced among the best "science drama" pieces yet seen on television; Dr. Gould's writing (e.g., a regular column in Natural History and numerous books) blends entertainment and learning beautifully; Dr. Morrison's writing and film work (e.g., Powers of Ten) are captivating.

Proceedings of the Conference with a complete list of participants, can be ordered from the Exploratorium, 3601 Lyon Street, San Francisco, CA 94123 (ask for Volume 5, Issues 2 & 3 of The Exploratorium).

5. ADULT/EXPERIENTIAL EDUCATION

5.1 Council for the Advancement of Experiential Learning (CAEL)  
Lake Front North  
Suite 300  
Columbia, Maryland 21044  
(301) 997-3535

Helps individuals gain credit for work experience. Specializes in assessment learning. Publishes newsletter, has conferences (summer, 1982 teleconference was on computers and the media)

5.2 National Center for Educational Brokering (NCEB)  
National Institute for Work & Learning  
1211 Connecticut Avenue  
Washington, D.C. 20036

NCEB counselors train people to define their learning goals and help them evaluate their alternatives. NCEB works through libraries, educational institutions, and community centers.

5.3 PANEL (Peer Assistance Network in Experiential Learning)  
c/o National Society for Internship and Experiential Education (NSIEE)  
Suite 601  
1735 I Street, N.W.  
Washington, D.C. 20006  
(800) 424-2933

PANEL provides computer-based networking information on internships, field experiences, service learning, cooperative education, practicums and community service. NSIEE publishes a newsletter.

5.4 National Commission on Resources For Youth (NCRY)  
36 W. 44th. St.  
New York, NY 10036

National clearinghouse and network for over 1000 youth participatory programs emphasizing service learning and internships.

5.5 Stopout! Working Ways To Learn  
By Joyce Mitchell, N.Y.: Avon, 1978

Useful book which lists places to work/learn. Clusters include: arts, communications, education, environment, government agencies, health consumer protection, religious groups, women and minorities.

5.6 American Society for Training and Development  
60 Maryland Avenue, S.W.  
Washington, D.C. 20024

Professional organization for business trainers. Assists on-the-job training and corporation education.

5.7 Outward Bound, Inc.  
384 Field Point Rd.  
Greenwich, Conn. 06830  
(203) 661-0797

Development of self-confidence and leadership skills through group experiences and challenges in outdoor settings (e.g., expeditions, marathon-running, rappelling, mountain-climbing). World-wide sites, with projects in high schools and universities.

5.8 Association for Experiential Education (AEE)  
 Suite F203  
 7200 Dry Creek Road  
 Englewood, Colorado 80112  
 (303) 779-0519  
 Executive Officer: Stephanie Takis

5.9 Adult and Continuing Education Today Newsletter  
 1221 Thurston  
 Manhattan, Kansas 66502  
 (202) 783-2505

5.10 Self-Discovery Through the Humanities Program  
 National Council on the Aging, Inc.  
 600 Maryland Avenue, S.W.  
 West Wing 100  
 Washington, D.C. 20024

5.11 Elderhostel  
 100 Boylston St.  
 Suite 200  
 Boston, Mass. 02116

5.12 Great Decisions Program  
 Foreign Policy Association  
 205 Lexington Avenue  
 N.Y., N.Y. 10016

5.13 Great Books Foundation  
 307 N. Michigan Avenue  
 Chicago, Ill. 60601

5.14 Institute of Lifelong Learning  
 NRTA/AARP  
 1909 K Street, N.W.  
 Washington, D.C. 20049

Outgrowth of the Outward Bound movement, but expanded to include other forms of out-of-school learning. Publishes Journal of Experiential Education, has annual conferences. Publishes Jobs Clearinghouse, for professionals in the field.

Publishes updates and news relevant to adult education. Operates the Learning Resources Network, a non-credit, community-based learning project.

Presents topics in literature, history philosophy, sociology, anthropology through cassette tapes and study guides at no charge. Organizes supporting visits to local museums, art galleries and historical landmarks.

Fun and education for people over 60. Courses are given throughout the country without grades or exams. Started with 200 participants in 1975; in 1981, program as 35,000 participants.

Yearly program designed to give Americans an opportunity to explore eight major foreign policy issues. Free briefing book. Participants study alone or in groups.

Selects and publishes sets of readings for discussions. Helps individuals organize discussion groups through free guide-book.

The American Association of Retired Persons (AARP) publishes a magazine Modern Maturity, which introduces various topics. Interested members can send away for a free follow-up booklet on each topic. Booklets include a bibliography, exercises based on the text, and suggested readings.

5.15 Congressional Clearinghouse  
on the Future  
Congress of the United States  
House of Representatives  
Washington, D.C. 20515  
Attn: Hon. Albert Gore

Off-the-record program which  
"provides Members of Congress and  
leading thinkers to consider new  
ideas and possibilities for the  
future." Informal "chautauquas" have  
included discussions on a variety of  
issues. Publishes monthly newsletter,  
What's Next? for general public.

6. INFORMAL LEARNING PROJECTS

6.1 Outdoor Biology Instructional  
Strategies (OBIS)  
Science in the Parks.  
Traveling Van in Shopping  
Malls  
c/o Lawrence Hall of Science (LHS)  
University of California  
Berkeley, CA 94720  
(415) 642-4193

The Lawrence Hall of Science has  
developed a variety of innovative out-  
of-school projects which bring science  
to the public. Community group leaders  
lead hands-on ecology activities based  
on self-contained OBIS folios.  
Other activities are geared for family  
groups in park settings.  
Science exhibits travel to shopping  
malls.

6.2 Smithsonian Family Learning  
Project (SFLP)  
Chesapeake Bay Center for  
Environmental Studies  
Smithsonian Institution  
POB 28  
Edgewater, Maryland 21037  
(202) 261-4190

Innovative series of delightful do-it-  
yourself family activities which use  
simple materials to explore various  
aspects of science (e.g., "Pizza  
Geography", "Ants in Your Plants").  
Families wishing to "field test" these  
activities can do so by writing to the  
SFLP office.

6.3 Center for the Development of  
Non-Formal Education (CEDEN)  
2109 E. 2nd. St.  
Austin, Texas 78702  
(512) 477-1130

Brings programs on topics such as  
nutrition and child-rearing to low  
income families living in the Spanish  
barrios, using culturally consistent  
informal learning materials.

7. COMPUTER LEARNING PROJECTS

7.1 ComputerTown, U.S.A.  
People's Computer Company  
POB E  
Menlo Park, CA 94025  
(415) 323-3111

National project designed to bring  
"computer literacy" to communities  
by creating informal computer-using  
groups. Publishes News Bulletin and  
an Implementation Manual for new  
ComputerTown groups.

7.2 Future Center  
Capital Children's Museum  
800 3rd. St., N.E.  
Washington, D.C. 20002  
(202) 543-8600  
"A showcase for technology and kids" inside a Children's Museum. Goal is to develop a futuristic classroom which can experiment with innovations in computer/information technology education for children.

7.3 Sesame Place  
100 Sesame Rd.  
Langhorne, PA 19047  
A 15 acre "futuristic play park" which aims to "fuse entertainment with education." Included are over 70 specially-adapted electronic learning games in the Computer Gallery.

7.4 Young People's Logo Association  
1208 Hillsdale Drive  
Richardson, TX 75081  
(214) 783-7548  
Attn: Jim Muller  
A national association of children interested in learning, using, and exploring the Logo, an educational programming language developed for children.

7.5 Dr. Al Bork  
Educational Technology Center  
University of California  
Irvine, CA  
Dr. Bork has developed self-contained computer-based learning modules for use in public libraries and other public places (e.g., airport lounges, shopping centers).

7.6 Computer Camps  
a) Atari Computer Camps  
(800) 847-4180  
b) CompuCamp  
POB 20141  
Santa Barbara, CA  
(805) 961-3818  
c) Computer Camp, Inc.  
1235 Coast Village Rd.  
Santa Barbara, CA  
(805) 969-7871  
d) Camp La Jolla  
Loyola-Marymount University  
Westchester, CA  
(213) 976-9032  
All these camps offer a healthy dose of hands-on computer experience, accompanied by typical camp-like activities (e.g., swimming, crafts, sports, drama). Specific details, including cost, differ from camp to camp.

7.7 Computer Classes  
a) CompuKids, Inc.  
1798 Kelton Ave.  
Westwood, CA  
(213) 473-8002  
b) The Learning Circuit  
2083 Westwood Blvd.  
West L.A., CA  
(213) 475-8528  
These businesses represent a very small percentage of the competition. Classes vary in size, emphasis and approach.

c) The Math Gym  
 6090 Sepulveda Blvd.  
 Suite 430  
 Culver City, CA  
 (213) 417-8066

7.8 Atari Institute for Education  
 Action Research  
 1196 Borregas Avenue  
 Sunnyvale, CA 94086  
 (408) 745-2666

8. SOFTWARE

8.1 The Learning Company (TLC)  
 4370 Alpine Road  
 Portola Valley, CA 94025  
 (415) 851-3160

8.2 Joyce Hakansson Associates  
 1450 6th. St.  
 Berkeley, CA 94710  
 (415) 526-7044

8.3 Courseware Magazine  
 4919 N. Millbrook Avenue  
 Suite 222A  
 Fresno, CA 93726

8.4 Picodyne  
 3000 Alpine Rd.  
 Ladera, CA 94025  
 (415) 854-3088

8.5 Evaluator's Guide For Microcomputer-Based Instructional Packages  
 Published by the International Council  
 for Computers in Education (ICCE)  
 Department of Computer & Information  
 Science  
 University of Oregon  
 Eugene, Oregon 97403  
 (503) 686-4429  
 48 pp. \$2.50 each

Supports projects with innovative uses of computers in education. Some of these projects involve informal learning with computers.

In a growing zoo of software companies, these four represent among the better efforts in developing educational software, especially for informal learning. TLC places its emphasis directly on programs for childhood learning and development. Joyce Hakansson was computer games coordinator for Sesame Place (see 7.3). CourseWare Magazine presents 2 complete programs on diskette with full documentation, every other month. Picodyne specializes in personalized software, including computer networking applications. ICCE has 23 organizational members; its Evaluator's Guide provides an excellent framework for software evaluation.

9. RESEARCH

9.1 Laboratory of Comparative Human Cognition (LCHC)  
University of California, San Diego  
La Jolla, CA 92093  
(714) 452-2740

Currently investigating a number of computer-related projects e.g., a) the use of computers with learning-disabled children, b) a message network for children, c) the feasibility of linking rural schools in Alaska with San Diego schools. Quarterly newsletter has excellent reviews and research articles.

9.2 Center for Children and Technology  
Bank Street College  
610 West 1112th. St.  
N.Y., N.Y. 10035  
(212) 663-7200  
Attn: Dr. Karen Scheingold

The Center is investigating the effect of computer activities on children's language.

9.3 Researchers:

- a) Dr. Emily Vargas Adams  
CEDEN  
2109 E. 2nd.  
Austin, Texas 78702  
(512) 477-1130
- b) Dr. Vallerie Geller  
2C - 576  
Bell Labs  
Murray Hill, N.J. 07974  
(201) 582-4255
- c) Dr. Patricia Greenfield  
Department of Psychology  
University of California  
Los Angeles, CA  
(213) 825-7526
- d) Dr. Ted Kahn  
Atari Institute  
1196 Borregas Avenue  
Sunnyvale, CA 94086  
(408) 995-7035
- e) Liza Loop  
Loop Center, Inc.  
3781 Starr King Circle  
Palo Alto, CA 94306  
(415) 858-2034

This a beginning--and by no means comprehensive--list of people doing research in the area of informal learning and computers. Geller is working on telecomputing and electronic mail research. e.g., developing "interest profiles". Greenfield is writing a book on children and media (including computers), based on research work. Loop has written on learning environments with computers. Miller has written her Ph.D. on educational settings and library media (including the use of computers; see bibliography of this paper). Norman is working on the locus of control, self-concept and computers for his dissertation; his field site is the Capital Children's Museum. Papert is affiliated with the World Center for Computers and Human Resources and is conducting research on computers in informal settings. Perriaut is considered a world expert on informal learning and is currently involved with computer "user groups" in France. Turkle is a sociologist who has conducted research on "computer culture" (her book, The Intimate Machine, will be published in Spring, 1983 by Harper & Rowe). Kahn, Rosenfeld, and Adams are writing a book on Informal Learning and Computers: Toward Creative Self Education

f) Dr. Inabeth Miller  
Harvard Graduate School of  
Education  
Gutman Library  
6 Appian Way  
Cambridge, MA 02138  
(617) 495-4225

g) Brad Norman  
5401 Blackistone Rd.  
Bethesda, MD 20816  
(301) 229-7179

h) Dr. Seymour Papert  
22 Avenue Matignon  
Paris 75008  
268-11-00

i) Jacques Perriaut  
Institut National de Recherche  
Pedagogique (INRP)  
Paris  
657-11-67

j) Dr. Sherman Rosenfeld  
Youth Activities Section  
Weizmann Institute of Science  
Rehovot, Israel  
(054) 721-80

k) Prof. Sherry Turkle  
Science Technology and Society  
Program  
M.I.T. E-51 201C  
Cambridge, Mass. 02139  
(617) 253-4068

## RECOMMENDATIONS TO THE ATARI INSTITUTE

1. The Institute should become a clearinghouse of information and models of excellence in the area of informal learning and computers.

Specifically:

- 1.1 The Institute should develop a library of appropriate reference books and periodicals relating to informal learning (see Resource Guide).
- 1.2 The Institute should invite various individuals in the field to visit the Institute and prepare invited talks; tapes and transcripts of these talks should be kept in the library.

2. The Institute should take an active role in creating new models in the area of informal learning and computers.

Specifically:

- 2.1 The Institute should encourage exemplary informal learning projects to become involved with computers via the Institute.
  - 2.11 It should actively seek out these projects and encourage them to submit proposals for funding from the Institute.
  - 2.12 It should attend meetings of the various associations involved and encourage appropriate individuals to give reports on informal learning and computers at these meetings.
  - 2.13 It should help funded projects develop implementations kits to distribute to similar organizations, through established channels (e.g., newsletters, conferences).
- 2.2 The Institute should encourage computer buffs to become involved with informal learning projects.
  - 2.21 It should publicize information about these projects to computer-oriented individuals, through the appropriate phone, periodical, and personal channels.
  - 2.22 It should hold meetings on an yearly basis which bring together individuals who are not computer-oriented and who are working in the field of informal learning, with computer-oriented people, to share ideas, problems, and solutions.
- 2.3 The Atari Institute for Education Action Research should take an active role in promoting action research and the study of "what is naturally happening" with computers in out-of-school settings.

- 2.31 It should encourage, support and fund selected education action research in this field, particularly as it relates to specific Institute-funded projects.
- 2.32 It should assist grantees in the development of specific action research skills, which can be used to research & evaluate their projects.
- 2.33 It should encourage, support and fund selected grants for individuals to write and publish articles dealing with new models of informal learning and computers.

3. The Institute should sponsor a national conference on "Informal Learning and Computers", to help implement the above recommendations and to stimulate further growth and development in this field.

## BIBLIOGRAPHY

Adams, Emily Vargas. Non-Formal Education: Assessment at the National Level. Unpublished manuscript; report for World Education, 1980.

Brandt, Richard M. Studying Behavior In Natural Settings. N.Y.: Holt, Rinehardt and Winston, Inc., 1972.

Brown, Dean and Lewis, Joan. "The Process of Conceptualization: Some Fundamental Principles of Learning Useful in Teaching With or Without the Participation of Computers." Stanford Research Institute (SRI Project 6747), December, 1968.

Bruner, Jerome S.; Jolly, Alison; and Sylva, Kathy (editors). Play: Its Role in Development and Evolution. New York: Basic Books, Inc., 1976.

Caspi, Moshe. "Everywhere: A Creative Self-Education Approach." Interchange, Volume 4, No. 4, pp. 53-61, 1977.

Caspi, Moshe, and Kahn, Ted. "An Educational Conceptualization for the Proposed 'Center for the Study of Informal Learning and Play.' "Unpublished memo, Lawrence Hall of Science, January 11, 1977.

Caspi, M. and Kibel, B. "Challenge: Invent an Educational Method. 200,000 Alternative Ways to Teach/Learn a Subject." In press, 1982 (Hebrew University).

Cross, Patricia. Adults As Learners. S.F.: Jossey-Bass, 1981

Diamond, Judy. The Ethology of Teaching: A Perspective from the Observations of Families in Science Centers. Unpublished doctoral dissertation. Group in Science and Math Education. Berkeley, 1980.

Gottfried, Jeffry L. A Naturalistic Study of Children's Behavior in a Free-Choice Learning Environment. Unpublished doctoral dissertation. Group in Science and Math Education. Berkeley, 1979.

Falk, John. Science Education for the Citizen: Perspectives on Informal Learning. Paper presented at the Chelsea Conference, January, 1982 (available from Smithsonian Institution, P.O.B. 28, Edgewater, Maryland, 21037)

Greenfield, P., and Lave, J. "Cognitive Aspects of Informal Education", in D.A. Wagner & H.W. Stevenson (Eds.), Cultural Perspectives on Child Development, San Francisco: W.H. Freeman, 1982.

Kahn, Bob, Computers and Science Museums--Part II. People's Computers. September-October, 1978, pp. 20-26.

Kahn, Bob. Public Access to Personal Computing: A New Role for Science Museums. Computer Magazine, April, 1977, pp. 56-66.

Kee, Daniel W. "Implications of Hand Held Electronic Games and Microcomputers for Informal Learning." Paper prepared for the Home Community and Work Division, National Institute of Education. January, 1981.

Knowles, Malcolm. The Adult Learner: A Neglected Species. Houston: Gulf, 1978.

Laetsch, W.M. "Conservation and communication: A tale of two cultures". SEMC Journal, 1979, pp. 1-8.

Levin, James A. "Computers in Non-School Settings: Implications for Education". SIGCUE Bulletin, June, 1982.

Levin, J.A. and Kareev, Y. "Problem solving in everyday situations". The Quarterly Newsletter of the Laboratory of Comparative Human Cognition, 1980, 2, 45-51.

Loop, Liza and Lew Christiansen. Microcomputer Learning Environments. Far West Labs (S.F.), 1981.

Loop, Liza; Anton, Julia; Zamura, Ramon, and the staff of CTUSA. ComputerTown: A Do-It-Yourself Community Computer Project Available through E.R.I.C., June, 1982.

Malone, T. "What makes things fun to learn? A study of intrinsically motivating computer games." Palo Alto, CA" Xerox Palo Alto Research Center, 1980.

Medrich, E.A.; Roizen, J.A.; Rubin, V.; and Stuart Buckley. The Serious Business of Growing Up: A Study of Children's Lives Outside School. Berkaley: University of California Press, 1982.

Miller, Inabeth. Educational Settings with Particular Focus Upon Library Media Operations: Realities and Possibilities - State of the Art. Unpublished doctoral dissertation. Boston University, 1982.

Minsky, M. "Form and Content in Computer Science." JACM, Vol. 17, No. 2, April 1970, pp. 197-215.

Morrison, Philip. Presentation. Exploratorium Science Media Conference. Published by the Exploratorium, 3601 Lyon Street, San Francisco, CA 94123, 1981.

Papert, Seymour. Mindstorms: Children, Computers and Powerful Ideas. Basic Books (N.Y.) 1980.

Peterson, Dick. Lifelong Learning in America. S.F.: Jossey-Bass, 1979.

Roberts, J.I. and S.K. Akinsanya. Schooling in the Cultural Context: Anthropological Studies of Education. N.Y. McKay Co., 1976.

Rosenfeld, S. Informal Learning in Zoos: Naturalistic Studies of Family Groups. Unpublished doctoral dissertation. Group in Science and Math Education. Berkeley, 1980.

Serrell, B. "Who's Really Watching Whom at the Shedd Aquarium?" Aquaticus, Vol. 10, No. 3 (Winter, 1978), pp. 6-7.

Spradley, James P. and David W. McCurdy. The Cultural Experience: Ethnography in Complex Society. Palo Alto: SRA, Inc., 1972.

Teroff, Murray, and Siltz, Roxanne. The Network Nation. N.Y.: Addison-Wesley, 1978.

Tough, Allen. The Adults Learning Projects: A Fresh Approach to Theory and Practice of Adult Learning. Ontario Institute for Studies in Education, 1971.

White, B.Y. Designing Computer Games to Facilitate Learning, Doctoral dissertation, M.I.T., February, 1981.